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OFFICE OF REGIONAL ADMINISTRATOR

Mr. Valdas V. Adamkus, Regional Administrator
U. S. Environmental Protection Agency
Region V
230 South Dearborn
Chicago, Illinois 60604

Dear Mr. Adamkus:

SUBJECT: INVITATION TO PARTICIPATE ON TECHNICAL REVIEW COMMITTEE

A technical review committee is being formed by this agency for the purpose of evaluating the present condition of a research site used by the Manhattan Engineer District (MED) and the U. S. Atomic Energy Commission (AEC) during the early years of nuclear reactor development. The site, known as Site A, is located in the Cook County Palos Forest Preserve near Palos Park, Illinois.

The committee will be comprised of technical representatives from various Federal, State, and local government entities with an interest in environmental and public health/safety. Their task will be to evaluate the environmental data that has been collected at the site over the last several years to look for evidence of trends or possible gaps in the data. Additionally, the committee will be asked to review, once again, the remedial action options considered in 1979, and any other options which may now be available as a result of waste treatment technology development in the last decade. The chairman of this committee will seek the professional opinions of all participants so that the Department of Energy might continue to pursue the most scientifically sound course of action.

A meeting is scheduled to take place at Argonne National Laboratory, Building 201, Room 3A at 1:00 p.m., October 15, 1987. A representative from your office with technical expertise in waste management and/or environmental monitoring (especially groundwater) would be greatly appreciated. Should your office elect to participate, you are requested to submit the name of the individual (with a phone number) to this office as soon as possible so that we might correspond and communicate with them directly.

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Celebrating the U.S. Constitution Bicentennial — 1787-1987

Mr. Valdas V. Adamkus

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Although your office has been receiving annual monitoring reports for this site, a summary of the data collected thus far has been completed and is being attached for your information. If there are any questions concerning this invitation, please call Mr. Bill Griffing, of our Operational and Environmental Safety Division, on 312-972-2835.

Sincerely,

A handwritten signature in dark ink, appearing to read "Hilary J. Rauch", with a stylized, flowing script.

Hilary J. Rauch
Manager

Enclosure:
Executive Summary

Updated: August 1987

Executive Summary

Contaminant Characterization of Site A and Plot M

Background

More than a hundred sites were used by the Manhattan Engineering District (MED), by the U. S. Atomic Energy Commission (AEC) for research facilities, and by the AEC's uranium suppliers and processors during the early years of development of the nuclear program in the United States. Although operations have long ceased at many of these sites, in many instances radioactive substances remain which can be a potential source of exposure to the public. The Department of Energy has an active program to ensure that the necessary precautions are taken in the management of these properties to provide for adequate protection of public health while allowing further use of land and other resources.

This summary addresses one of these MED/AEC sites known as Site A/Plot M, located in the Cook County Palos Forest Preserve near Palos Park, Illinois. Site A refers to the 19-acre experimental area where the CP-2 and CP-3 reactors and associated buildings and laboratories were built and operated by the University of Chicago Metallurgical Laboratory and Argonne National Laboratory from 1943 to 1956. Plot M refers to a 1-acre waste burial site approximately 2000 feet north of Site A.

History

In 1943, the U. S. Government leased 1,025 acres in the Palos Forest Preserve to serve as a site for nuclear research being conducted as part of the MED project. Equipment and facilities originally located at the University of Chicago, including the first nuclear reactor (CP-1), were moved to the site. The reassembled reactor, redesignated CP-2, and the first heavy water moderated reactor (CP-3) were operated at "Site A" along with several related laboratories and experimental facilities. In addition, a waste burial ground (approximately 150 feet by 140 feet) designated "Plot M" was located nearby. Although records from that era are incomplete, this waste site is known to have been used for the disposal of radioactive materials and contaminated equipment, animal carcasses, clothing, and building debris from the University of Chicago as well as Site A. Available records and employee interviews indicate that most of this waste would be, by today's definitions, a combination of low-level radioactive wastes and "mixed" (radioactive and hazardous) wastes in both solid and liquid forms.

Although discarded wastes were originally placed in Plot M in six-foot deep trenches starting in 1943, by 1948 waste materials were packaged in steel bins before burial. The disposal of waste material in Plot M ceased in June 1949. All of the steel bins were later removed prior to return of the property to the Forest Preserve District.

Since the lease of the Palos Site had been a temporary war-time measure, the research and waste disposal areas were decommissioned in 1956, and the property was returned to the District. In decommissioning the site, the research reactors were disassembled. Highly radioactive fuel and other internal components of both reactors were removed from the site. The biological shield of CP-3 was filled with concrete and tumbled into an adjacent fifty-foot deep pit excavated for this purpose, and buried along with other debris and rubble from the dismantling operation.

Plot M was decommissioned by excavating eight-foot deep trenches around the entire perimeter and laying in concrete walls. A one-foot thick concrete pad was then poured over the top, creating an inverted concrete box over the burial site. The concrete cap was then covered with about two feet of soil, graded and seeded. State-of-the-art portable survey equipment was then used to conduct a thorough radiological survey of both Site A and Plot M prior to the termination of the lease. No detectable surface contamination above natural background levels was found.

Environmental Monitoring

A limited environmental monitoring program was begun at the Palos site in 1954. Surface water, bottom sediment in streams, and soil were sampled for radioactivity. In 1963, sensitive radiochemical analyses showed evidence of very low levels of surface radioactivity (primarily uranium) resulting from the activities conducted at the site. Environmental monitoring over the following decade gave no evidence of increased movement of radioactive materials from either Site or Plot M although this monitoring was limited almost exclusively to the surface environment.

In 1973, the environmental monitoring program was expanded to include regular sampling of the Red Gate Woods picnic well (down-gradient of Plot M), and four other wells nearby, after the detection of elevated levels of tritium in this well. By 1975, sufficient data had been accumulated to conclusively show that low levels of tritium were present in three forest preserve wells. This led to the decision in 1976 to carry out a detailed radiological survey to document the condition of the site, determine the source of the tritium contamination, establish whether other radioactive materials were moving from the site, and to consider the necessity for remedial action.

The survey, conducted in 1976-1977, was divided into four main parts:

1. Radiochemical analyses of water from all existing wells in the area;
2. Radiochemical analyses of soil borings at Plot M and Site A, and of surface soil samples from the entire Site A area;

3. Drilling of several additional wells to measure radioactivity in groundwater near Site A and Plot M, and to provide hydrological information; and
4. A study of the geology of the area to determine the rate and direction of groundwater flow in the Forest Preserve.

The Water Resources Division of the U. S. Geological Survey was retained as a consultant for the groundwater study. In addition, the EG&G Corporation carried out an aerial radiation monitoring survey of the entire site.

The results of the 1976-1977 survey were:

1. Tritium was shown to be the only radioactive material moving from Plot M. Soil borings outside of Plot M that were analyzed for uranium, plutonium, strontium-90, and gamma ray emitters, including cesium-137, were found to contain these isotopes at natural background concentrations.
2. Soil corings outside and down-gradient of Plot M that were analyzed for tritium showed maximum concentrations between 10 and 30 feet below the surface. Soil corings taken from directly beneath Plot M showed maximum tritium concentrations at the 65 foot depth. No other radionuclides were observed in the soil corings from beneath Plot M.
3. Tritium was detected at elevated levels in the intermittent streams which drain Plot M although these concentrations had declined considerably over the previous two decades. Tritium could not be detected in the Illinois and Michigan Canal, the Sanitary and Ship Canal, the Des Plaines River, or in nearby ponds.
4. Three hand-pumped Forest Preserve picnic wells were found to have tritium attributable to Plot M. The tritium concentrations in the Red Gate Woods well were found to fluctuate markedly with the seasons in this well; the lowest concentrations in summer at the lowest limits detectable --0.2 nanocuries per liter (nCi/l) -- to a winter high of 14 nCi/l. The annual average in 1977 was about 7 nCi/l. The well opposite Red Gate Woods and further down-gradient, also showed the same seasonal tritium concentration patterns, about four months out of phase. The pattern was attributed to the movement of tritiated water from Plot M to the dolomite aquifer and down-gradient to the picnic wells, principally by the spring rains recharging the groundwater supply.
5. Tritium was also detected in surface and subsurface soil samples collected in the vicinity of Site A and the buried CP-3 reactor shell. These levels were lower than the Plot M samples and were shown to represent very little contribution to the tritium content of the groundwater.

6. The only soil samples collected at Site A which contained radioactivity above radioactive fallout levels were surface soils in isolated areas contaminated with strontium-90 and cesium-137. These were considered to be attributed to site activities but were not at levels deemed hazardous to the visiting public.
7. Dosimeters showed that dose rates measured in the Site A/Plot M area were about 100 mrem/year which is within the normal range expected in the Chicago area.

In 1979, two reports were prepared by Argonne National Laboratory for the Office of Remedial Action Programs which consolidated all of the available environmental data collected at Site A/Plot M for the purpose of considering available remedial action alternatives. These documents, entitled "Environmental Analysis..." and "Engineering Evaluation..." formed the basis for DOE's decision to select an action alternative of continued surveillance and maintenance. Since 1979, funding for the environmental monitoring program has been provided by the DOE Formerly Utilized Sites Remedial Action Program (FUSRAP).

Each year since being funded by FUSRAP, Argonne National Laboratory has produced a report summarizing the accumulated environmental data with emphasis on recent trends. A copy of each of these reports has been submitted to various internal and external organizations including the Illinois Department of Nuclear Safety (IDNS), the USEPA, the USGS, and the Cook County offices of the Forest Preserve District, Department of Public Health, and Department of Environmental Control.

For the most part, the environmental monitoring program has continued to expand each year as more monitoring wells have been installed by DOE and USGS in an attempt to characterize the subsurface contamination and migration pathways. In addition to the groundwater monitoring, samples continue to be collected and analyzed for contamination of the air, surface water, and stream sediment.

The following results represent the most current conditions for the various contaminant pathways:

Air

Water vapor samples collected over the bed of the stream which drains Plot M continue to show above ambient concentrations for tritium. This is attributed to tritiated water leaching from Plot M and evaporating from the surface stream. The maximum dose from tritium in air to a hypothetical individual who spent all of his time at the downstream location would be 0.005% of the DOE Radiation Protection Standard of 100 mrem/year.

Groundwater

There are now 17 monitoring wells down-gradient of Plot M which are being sampled quarterly as well as five picnic wells. All of these are screened to sample water from the dolomite aquifer. In addition to the dolomite wells, there are sixteen boreholes near Plot M which are drilled into the overlying glacial till which are being sampled quarterly for evidence of contaminant migration as well.

Of the water samples collected from the sixteen boreholes near Plot M in 1986, eight of them yielded strontium-90 concentrations greater than the detection limit of 0.25 pCi/L. These levels would not be expected in this water from radioactive fallout and are, therefore, presumed to be due to migration from Plot M. The boreholes with the highest strontium-90 concentrations are 6 and 11, which are located east of Plot M between the buried waste and the stream that flows nearby. There has been only a very modest increase in the level of strontium-90 in these boreholes over the last three years; perhaps still too early to be certain of a trend.

The boreholes were also analyzed for organic and inorganic contamination during 1986. Based on the sampling and analyses conducted on these samples, no hazardous waste constituents have been observed migrating from Plot M. More samples for these constituents will be analyzed in 1987.

The water samples collected from the dolomite wells in 1986 were consistent with tritium concentrations measured in the past. In all, eight of the dolomite wells had elevated tritium concentrations. The highest tritium levels are in the dolomite holes furthest north and near the surface stream that flows next to Plot M. Several thin sand/gravel lenses are known to underlie this stream and may be hydrologically connected to the dolomite in this area. This would provide a supply of tritiated water from Plot M to maintain the elevated and relatively constant levels in these holes.

The 1986 tritium data for the picnic wells continue to show the same seasonal variations as in previous years. The magnitude of the winter peak of tritium in the Red Gate Woods well is significantly less, however, than in previous years and has been trending downward over the last few years. This particular well is the location that provides the greatest potential radiation exposure to the public. If water equal to the well average concentration of 1.3 nCi/l were the sole source of water for an individual, the annual dose of tritium would be 0.26 mrem. This is much lower than the EPA drinking water limit of 4 mrem/year.

The picnic wells were also analyzed for inorganic contamination during 1986. The State of Illinois drinking water standard limits for lead and manganese were occasionally exceeded but it is believed that these concentrations are related to the decomposition of the well pump materials and not due to leached contaminants from Plot M.

Surface Water

Samples of surface water from the stream flowing past Plot M have been collected and analyzed for tritium for several years. 1986 samples continue to show the same pattern; that is, tritium increases in concentration in the water as it flows past Plot M and then decreases downstream due to dilution. The concentrations in the stream has remained essentially constant over the last several years. A seep at the northeastern base of the hill below Plot M continues to be a source of radioactive contamination to the stream. Elevated levels of tritium, strontium-90, plutonium-239, and uranium-234 can be detected in this seep water.

Sediment

Bottom sediment samples collected in the stream flowing past Plot M have been analyzed for various radionuclides over the last several years. The results of downstream sediment samples are consistent with previous years although cesium-137 and plutonium-239 show some slight elevation in 1986. These radionuclides are present in concentrations higher than one would expect from radioactive fallout and are believed to be from Plot M leachate.